This listing of claims will replace all prior versions, and listing of claims in the application:

Listing of claims:

Claim 1 (currently amended) A low~~Low~~ temperature extrusion process for energy optimized, viscosity adapted micro-structuring of frozen aerated masses ~~like ice cream with~~ having a mechanical treatment of a partially frozen, aerated mass over ~~the~~ a length of the extruder screw channel zone~~-wise adapted mechanical treatment of the partially frozen, aerated mass~~ with respect to its local viscosity, performed ~~carried out~~ such that, in each of ~~the~~ a subsequent ~~zones~~ zone ~~proceeding~~ there is a dispersing of air bubbles/air cells and at ~~the~~ a same time a temperature decrease and related increase of the frozen water fraction is achieved.

Claim 2 (currently amended) Process according to claim 1 comprising ~~characterized by~~ a characteristic length of the zones into which the extruder is divided with respect to ~~the~~ an adaptation of ~~the~~ a mechanical energy input for ongoing dispersing of air bubbles/air cells and synchronously decreasing temperature or increase of frozen water fraction~~-respectively~~, being ~~the~~ one to tenfold of the outer screw diameter~~, preferably the one to twofold of the outer screw diameter~~.

Claim 3 (currently amended) Process according to claim 1 comprising ~~characterized by~~ a characteristic length of the zones into which the extruder is divided with respect to ~~the~~ an adaptation of ~~the~~ a mechanical energy input for ongoing dispersing of air bubbles/air cells and synchronously decreasing temperature or increase of frozen water fraction ~~respectively~~, being ~~the~~ one to tenfold of the outer screw diameter,~~-preferably the one to twofold of the outer screw diameter~~ with a constant length of these zones along the extruder.

Claim 4 (currently amended) Process according to claim 1 comprising ~~characterized by~~ a characteristic length of the zones into which the extruder is divided with respect to ~~the~~ an adaptation of ~~the~~ a mechanical energy input or ongoing dispersing of air bubbles/air cells and synchronously decreasing temperature or increase of frozen water fraction ~~respectively~~, being ~~the~~

one to tenfold of the outer screw diameter~~, preferably the one to twofold of the outer screw diameter~~ with characteristic zone length adapted to the local change of the mass viscosity.

Claim 5 (currently amended) Process according to claim 1 comprising ~~characterized by~~ an adaptation of the processing parameters rotational screw speed ~~(1)~~, mass flow rate adjusted by a positive replacement pump installed at ~~the~~ an extruder inlet ~~(2)~~ and cooling temperature at ~~the~~ an inner wall of ~~the~~ an extruder housing adjusted by ~~the~~ an evaporation pressure of ~~the~~ refrigerant used ~~(3)~~ for a given extruder screw geometry, regulated in such a way, that for a conventional standard vanilla ice cream mass temperature ≤11° C or more generally a frozen water mass fractions of ca. ≥60% related to the total freezable water fraction are achieved within ~~the~~ a first 50–75% of ~~the~~ a length of the extruder measured from the extruder inlet~~, preferably within 50–65% of the length~~.

Claim 6 (currently amended) Process according to ~~claims~~ claim 1 ~~to 5 characterized by~~ comprising an adjustment of ~~the~~ a mechanical mass treatment with respect to its viscosity in the related extruder zone by adapted variation of the screw channel height.

Claim 7 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising an adjustment of ~~the~~ a mechanical mass treatment with respect to its viscosity in ~~the~~ a related extruder zone by adapted variation of ~~the~~ a number of screws.

Claim 8 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising an adjustment of ~~the~~ a mechanical mass treatment with respect to its viscosity in ~~the~~ a related extruder zone by adapted variation of ~~the~~ a screw angle.

Claim 9 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising an adjustment of ~~the~~ a mechanical mass treatment with respect to its viscosity in ~~the~~ a related extruder zone by adapted width variation of cuts in ~~the~~ a screw flight(s).

Claim 10 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising an adjustment of ~~the~~ a mechanical mass treatment with respect to its viscosity in

~~the~~ a related extruder zone by adjusted pins fixed at ~~the~~ an inner extruder barrel wall in such a way that they intermesh with ~~the~~ cuts in ~~the~~ screw flights.

Claim 11 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising an increasing temperature reduction and increasing frozen water fraction along the extruder length due to optimized heat transfer to an evaporating refrigerant contacting ~~the~~ an outer wall of ~~the~~ an extruder housing by minimizing ~~the~~ a leakage gap width between ~~the~~ an outer screw flight diameter and ~~the~~ an inner extrusion housing diameter.

Claim 12 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising a decreasing mass temperature, related increasing frozen mass fraction and increasing dispersing of ~~the~~ a microstructure along the extruder length due to optimized heat transfer to an evaporating refrigerant contacting ~~the~~ an outer wall of ~~the~~ an extruder housing by generating a flow pattern at ~~the~~ an outer front end of ~~the~~ a screw flight, which leads to a reduction of the frozen material wall layer thickness not being wiped off the screw flight(s) smaller than ~~the~~ a leakage gap width.

Claim 13 (currently amended) Process according to ~~claims~~ claim 1~~–5 characterized by~~ comprising a decreasing mass temperature, related increasing frozen mass fraction and increasing dispersing of ~~the~~ a microstructure along the extruder length due to optimized heat transfer to an evaporating refrigerant contacting ~~the~~ an outer wall of the extruder housing by generating a flow pattern at an ~~the~~ outer front end of a ~~the~~ screw flight, which leads to a reduction of the frozen material wall layer thickness not being wiped off by the screw flight(s) smaller than a ~~the~~ leakage gap width by adjusting ~~the~~ a profile of ~~the~~ a screw flight front edge which is incline to ~~the~~ an inner barrel wall or rounded with a well defined radius.

Claim 14 (currently amended) Device for low temperature extrusion process for energy optimized, viscosity adapted micro-structuring of frozen aerated masses having a mechanical treatment of a partially frozen, aerated mass over a length of the extruder screw channel zone with respect to its local viscosity, performed such that, in each of a subsequent zone there is a dispersing of air bubbles/air cells and at the same time temperature decrease and

related increase of the frozen water fraction is achieved, having a ~~under energy optimized viscosity adapted micro-structuring conditions of frozen aerated systems like ice cream according to claim 1 or one of the subsequent claims with~~ variable screw geometry along the extruder length locally adjusted according to ~~the~~ a local viscosity with respect to efficient progressive dispersing, simultaneous progressive temperature reduction and related freezing of water.

Claim 15 (currently amended) Device according to claim 14 ~~characterized by~~ comprising a leakage gap width between screw flight and inner wall of the barrel of less than 0.1 mm ~~preferably less than 0.05 mm~~.

Claim 16 (currently amended) Device according to claim 14 ~~characterized by~~ comprising a screw flight thickness between 2 and 20 mm and 1.: screw flight front edge inclination relative to the inner barrel wall of 10-45°, ~~preferably 30-35°, the inclination preferably applied to the outer first 2 mm of the screw flight height, or 2.: rounded screw flight front edge with a radius of preferably ≥2 mm~~.

Claim 17 (currently amended) Device according to claim 14 ~~characterized by~~ comprising an extruder screw channel height adjusted along the extruder length to mass viscosity whereas in the feeding zone (I) of the extruder the ratio of the screw channel height ~~H~~ to the outer screw diameter ~~D~~ is preferably adjusted between 0.03 and 0.07, in the middle (length) zone (II) between 0.1 and 0.15 and in the final third of the extruder length between 0.1 and 0.25.

Claim 18 (currently amended) Device according to claim 14 comprising ~~characterized by~~ a continuously increasing screw channel height over the extruder length such that ~~the~~ an unscrewed contour line of ~~the~~ a screw root between mass inlet and outlet, with the centre length axes of the screw forms an angle of 0.03 to 0.1°~~, preferably 0.05 to 0.07°~~.

Claim 19 (currently amended) Device according to claim 14 ~~characterized by~~ comprising screw(s) comprising 3 to 7 ~~preferably 4-5~~ screw flights in a ~~the~~ first third of the extruder length; with 1-4, ~~preferably 2-3~~ screw flights in ~~the~~ a second third of the extruder length

and with 1~~2~~-3 ~~preferably 1-2~~ screw flights in ~~the~~ a final third of the extruder length in the vicinity of ~~the~~ an extruder outlet.

Claim 20 (currently amended) Device according to ~~claims~~ claim 14 ~~and 19 characterized by~~ comprising a progressive reduction of ~~the~~ a number of screw flights over 2-10 ~~preferably 3-5~~ equal or variable length segments of the extruder, whereas the number of screws is continuously reduced by 1-2 screw flights from segment to segment.

Claim 21 (currently amended) Device according to claim 14 ~~characterized by~~ comprising screw angles in ~~the~~ an inlet zone (I) between 35 and 90°, ~~preferably between 45 and 60°,~~ in ~~the~~ a middle of the extruder between 30 and 45°, ~~preferably between 30 and 35°~~ and in ~~the~~ a final third of the extruder length between 20 and 35° ~~preferably between 25 and 30°~~.

Claim 22 (currently amended) Device according to claim 14 ~~characterized by~~ comprising a constant or variable screw angle reduction between 45 and 90°~~, preferably 45 and 60°~~ from ~~the~~ an extruder inlet zone (I) - to – between 20 to 35° ~~preferably 25 to 30°~~ in ~~the~~ an extruder outlet zone (III).

Claim 23 (currently amended) Device according to claim 14 ~~characterized by~~ comprising cuts in the screw flights over ~~the~~ a first 10 to 30%, ~~preferably 15 to 20%~~ of the extruder length.

Claim 24 (currently amended) Device according to ~~claims~~ claim 14 ~~and 21 to 23 characterized by~~ comprising screws having more than one screw flight and cuts in the respective screw flights which are shifted axially such that the mass is subjected to scraping/"wiping off" flow at each part of ~~the~~ an inner barrel wall.

Claim 25 (currently amended) Device according to ~~claims~~ claim 14 ~~and 23 characterized by~~ comprising cuts in ~~the~~ a screw flights where ~~the~~ a length of these cuts is ~~the~~ 2.5- to 3-fold, ~~preferably the 1- to 2-fold~~ of ~~the~~ a screw channel height and where the ~~same dimensions are valid for the~~ non-cut parts of the screw flights have the same dimensions.

Claim 26 (currently amended) Device according to ~~claims~~ claim 14~~, 23 and 24~~ ~~characterized by~~ comprising inbuilt elements~~, e.g. pins,~~ connected to ~~the~~ an inner barrel wall, intermeshing with ~~the~~ cuts in ~~the~~ a screw flights during screw rotation.

Claim 27 (currently amended) Device according to ~~claims~~ claim 14 ~~and 25~~ ~~characterized by~~ comprising elements~~, e.g. pins,~~ connected to ~~the~~ an inner barrel wall at 2-10~~, preferably 3-5~~ different positions ~~regularly or irregularly~~ arranged at ~~the~~ a perimeter of ~~the~~ an inner barrel wall.

Claim 28 (currently amended) Device according to ~~claims~~ claim 14 ~~and 25 to 27~~ ~~characterized by~~ comprising more than one screw flights ~~where~~ having cuts in ~~these screw flights have~~ the same axial position to allow for intermeshing with ~~the~~ inbuilt elements~~, e.g. pins~~.

Claim 29 (currently amended) A ~~Device according to claims 14 and 28 characterized by a~~ single or twin-screw extruder arrangement for low temperature extrusion of frozen, aerated masses and adapted geometry characteristics comprising a mechanical treatment of a partially frozen, aerated mass over a length of the extruder screw channel zone with respect to its local viscosity, performed such that, in each of a subsequent zone there is a dispersing of air bubbles/air cells and at the same time temperature decrease and related increase of the frozen water fraction is achieved, having variable screw geometry along the extruder length locally adjusted according to a local viscosity with respect to efficient progressive dispersing, simultaneous progressive temperature reduction and related freezing of water ~~according to one or more of the claims 14 to 28~~.